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LAKE KEGONSA, DANE COUNTY, WISCONSIN

Pacific Northwest Environmental Research Laboratory

Prepared for:

National Environmental Research Center
Wisconsin National Guard
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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
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REPORT

ON

LAKE KEGONSA

DANE COUNTY

WISCONSIN

EPA REGION V

WORKING PAPER No. 40

WITH THE COOPERATION OF THE

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

AND THE

WISCONSIN NATIONAL GUARD

OCTOBER, 1974

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Wisconsin Department of Natural Resources for professional involvement and to the Wisconsin National Guard for conduct of the tributary sampling phase of the Survey.

Francis H. Schraufnagel, Acting Assistant Director, and Joseph R. Ball of the Bureau of Water Quality, and Donald R. Winter, Lake Rehabilitation Program, provided invaluable lake documentation and counsel during the Survey. Central Office and District Office personnel of the Department of Natural Resources reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper series.

Major General James J. Lison, Jr., the Adjutant General of Wisconsin, and Project Officer CW-4 Donald D. Erickson, who directed the volunteer efforts of the Wisconsin National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

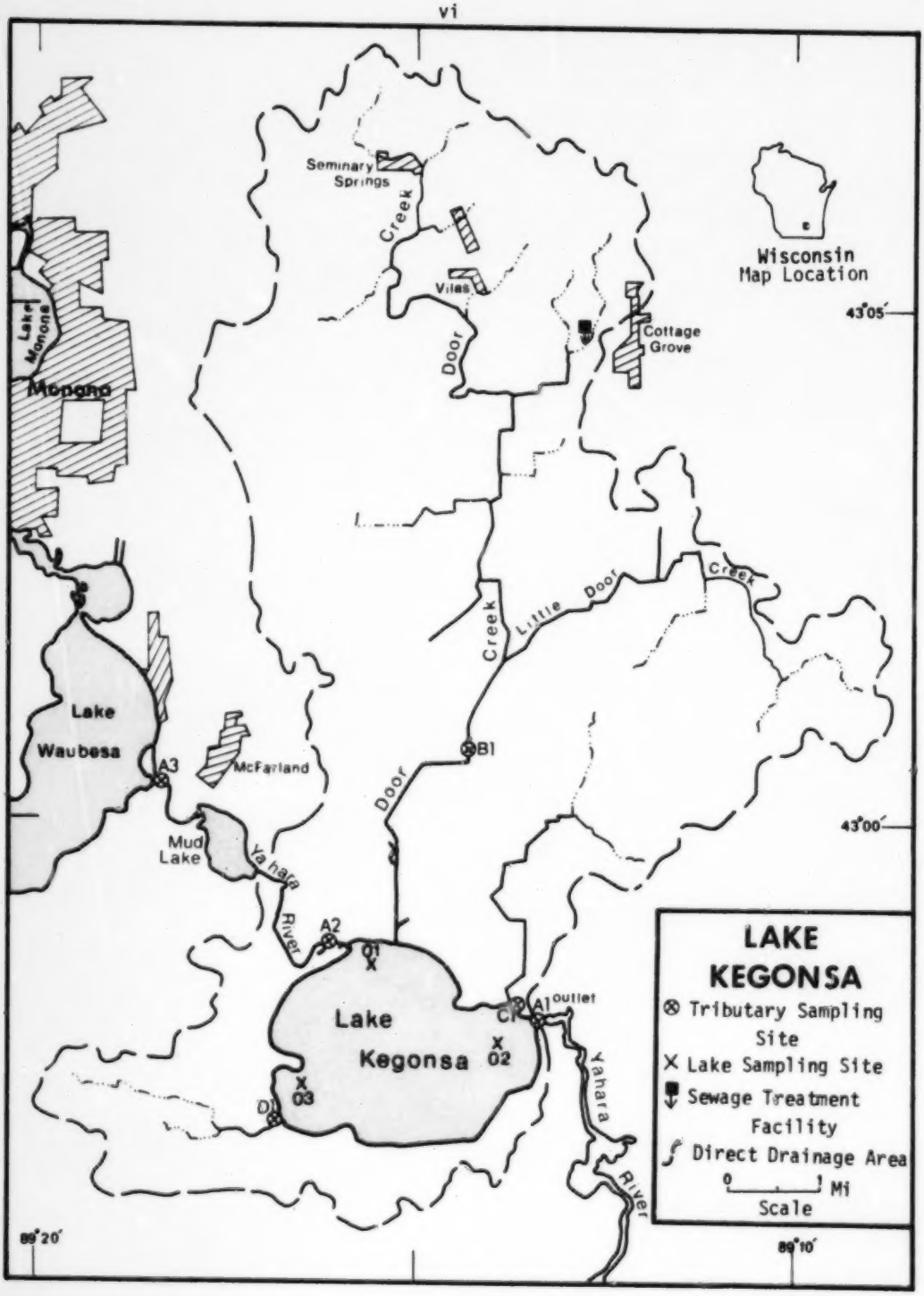
NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF WISCONSIN

LAKE NAME	COUNTY
Altoona	Eau Claire
Beaver Dam	Barron
Beaver Dam	Dodge
Big Eau Pleine	Marathon
Browns	Racine
Butte des Morts	Winnebago
Butternut	Price, Ashland
Castle Rock Flowage	Juneau
Como	Walworth
Crystal	Vilas
Delavan	Walworth
Eau Claire	Eau Claire
Elk	Price
Geneva	Walworth
Grand	Green Lake
Green	Green Lake
Kegonsa	Dane
Koshkonong	Jefferson, Rock, Dane
Lac La Belle	Waukesha
Long	Price
Middle	Walworth
Nagawicka	Waukesha
Oconomowoc	Waukesha
Okauchee	Waukesha
Petenwell Flowage	Juneau
Pewaukee	Waukesha
Pigeon	Waupaca
Pine	Waukesha
Poygan	Winnebago, Waushara
Rock	Jefferson
Rome Pond	Jefferson, Waukesha
Round	Waupaca

LAKE NAME	COUNTY
Shawano	Shawano
Sinnissippi	Dodge
Swan	Columbia
Tainter	Dunn
Tichigan	Racine
Townline	Oneida
Trout	Vilas
Wapogassett	Polk
Wausau	Marathon
Willow	Oneida
Winnebago	Winnebago, Fond Du Lac, Calumet
Wisconsin	Columbia
Wissota	Chippewa
Yellow	Burnett


Seminary Springs
Creek
Wisconsin
Map Location
Lake Monona
Monona
Villas
Door
Cottage Grove
43°05'
Little Door Creek
Creek
Lake Waubesa
A3
McFarland
B1
Door
43°00'
Mud Lake
Yahara River
A2
01
Lake Kegonsa
C1
A1 outlet
02
03
D1
Yahara River
89°20'
89°10'
LAKE KEGONSA
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Direct Drainage Area
0 1 Mi
Scale

LAKE KEGONSA

STORET NO. 5520

I. CONCLUSIONS

A. Trophic Condition:

Survey data and the records of others show that Lake Kegonsa is eutrophic.

B. Rate-Limiting Nutrient:

Algal assay and lake data indicate Lake Kegonsa is nitrogen limited.

C. Nutrient Controllability:

1. Point sources--During the sampling year, Lake Kegonsa received a total phosphorus load at a rate over 2½ times that suggested by Vollenweider (in press) as "dangerous"; i.e., a eutrophic rate (see page 13). However, less than 3% of that load was contributed by the Village of Cottage Grove, the only known point source in the drainage. It is concluded that phosphorus control at Cottage Grove would not be expected to have any significant effect on the trophic condition of the lake.

The estimates of septic tank contributions to Lake Kegonsa may be too conservative, but a shoreline survey would have to be done to determine the actual significance of these sources. It appears that such a survey should include Lake Waubesa.

2. Non-point sources--It is calculated that the Yahara River drainage contributed nearly 83% (37,180 lbs) of the total phosphorus

load to Lake Kegonsa during the sampling year (see page 13). Of this load, 95% (35,350 lbs) is attributable to the outlet of Lake Waubesa. It is not known whether this load is the result of the past effluent fertilization of Lake Waubesa or, as suggested by Fitzgerald (1972), results from present sources of phosphorus. Whatever the case may be, it seems evident that any significant improvement in the existing trophic condition of Lake Kegonsa is dependent on a marked reduction in the amount of phosphorus leaving Lake Waubesa.

II. INTRODUCTION

Lake Kegonsa is the last in a Dane County chain of four lakes that are collectively known as the "Madison Lakes". All are located near the City of Madison in the lower Rock River drainage of south central Wisconsin. Severe algal blooms were reported in Lakes Mendota and Monona as early as 1882 (Trelease, 1889), and the use of copper sulfate to control algae was begun as early as 1918 (Mackenthun and Cooley, 1952).

Raw sewage from the City of Madison was discharged to Lake Mendota and Monona from 1884 to 1889; but, with the completion of a treatment plant in 1899, discharges to Mendota were discontinued, and in 1926 a new treatment plant was put in use with effluent discharge via Nine-Springs Creek to the Yahara River just upstream from Lake Waubesa (Sawyer, 1947). The discharge resulted in nuisance algae growths, odors, and periodic fish kills in Lakes Waubesa and Kegonsa, and eventually legislative and legal action forced the diversion of the effluent around the lakes to Badfish Creek and thence to the Yahara River below Lake Kegonsa (Mackenthun, Lueschow, and McNabb; 1960).

Evidently, the effluent diversion has resulted in an improvement of the trophic condition of Lake Kegonsa. Sawyer (1971) stated, "...the sewage treatment plant effluent was finally diverted from them [Waubesa and Kegonsa]..., and the lakes have reverted to an acceptable level of eutrophy..." However, in a recent report, Fitzgerald (1972) notes that "...phosphorus is present in the lake [Kegonsa] in excess of that which can be utilized by the dense growths of algae or aquatic weeds present, and this situation has not changed since 1943 despite the diversion around Lake Waubesa and Kegonsa...in 1958."

III. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry*;

1. Surface area: 2,716 acres.
2. Mean depth: 17 feet.
3. Maximum depth: 29 feet.
4. Volume: 46,172 acre/feet.
5. Mean hydraulic retention time: 136 days.

B. Tributary and Outlet:
(See Appendix A for flow data)

1. Tributaries -

Name	Drainage area†	Mean flow†
Yahara River	331.0 mi^2	152.6 cfs
Door Creek	27.0 mi^2	9.5 cfs
Minor tributaries & immediate drainage -	21.8 mi^2	9.2 cfs
Totals	379.8 mi^2	171.3 cfs

2. Outlet -

Yahara River	384.0 mi^{2}††	171.3 cfs

C. Precipitation†††:

1. Year of sampling: 37.7 inches.
2. Mean annual: 30.2 inches.

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* Dept. of Natural Resources lake survey map (1955).
† Drainage areas are accurate within ±0.5%; mean daily flows are accurate within ±40%; mean monthly flows are accurate within ±35%; and nomalized mean monthly flows are accurate within ±35%.
†† Includes area of lake.
††† See Working Paper No. 1, "Survey Methods".

IV. LAKE WATER QUALITY SUMMARY

Lake Kegonsa was sampled three times during the open-water season of 1972 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the lake and generally from a number of depths at two of the stations (see map, page vi). During each visit, a single depth-integrated (near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the last visit, a single five-gallon depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 18 feet at station 2 and 6 feet at station 3; only near-surface samples were taken at station 1.

The results obtained are presented in full in Appendix B, and the data for the fall sampling period, when the lake was essentially well-mixed, are summarized below. Note, however, the Secchi disc summary is based on all values.

For differences in the various parameters at the other sampling times, refer to Appendix B.

A. Physical and chemical characteristics:

Parameter	Minimum	Mean	Median	Maximum
		FALL VALUES (11/10/72)		
Temperature (Cent.)	6.4	6.6	6.7	6.7
Dissolved oxygen (mg/l)	10.0	11.1	11.2	11.7
Conductivity (μmhos)	420	431	430	440
pH (units)	8.3	8.7	8.8	8.8
Alkalinity (mg/l)	155	174	178	181
Total P (mg/l)	0.083	0.103	0.104	0.112
Dissolved P (mg/l)	0.053	0.065	0.068	0.070
NO_2 + NO_3 (mg/l)	0.210	0.237	0.220	0.280
Ammonia (mg/l)	0.160	0.171	0.170	0.190
		ALL VALUES		
Secchi disc (inches)	36	44	42	56

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Number per ml
06/22/72	1. Anabaena	3,110
	2. Oocystis	633
	3. Melosira	235
	4. Cyclotella	181
	5. Polycystis	145
	Other genera	542
	Total	4,846
08/20/72	1. Dinobryon	1,844
	2. Polycystis	597
	3. Anabaena	380
	4. Fragilaria	307
	5. Gloeocapsa	289
	Other genera	1,719
	Total	5,136
11/10/72	1. Dinobryon	964
	2. Flagellates	768
	3. Anabaena	361
	4. Scenedesmus	286
	5. Cyclotella	271
	Other genera	1,763
	Total	4,413

2. Chlorophyll a -
(Because of instrumentation problems during the 1972 sampling, the following values may be in error by plus or minus 20 percent.)

Sampling Date	Station Number	Chlorophyll a (µg/l)
06/22/72	01	11.5
	02	30.1
	03	27.6
08/20/72	01	25.1
	02	36.4
	03	19.1
11/10/72	01	49.4
	02	16.5
	03	62.2

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.038	0.280	7.8
0.006 P	0.044	0.280	7.7
0.012 P	0.050	0.280	7.6
0.024 P	0.062	0.280	8.0
0.060 P	0.098	0.280	7.8
0.060 P + 10.0 N	0.098	10.280	45.8
10.0 N	0.038	10.280	16.8

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicated a high potential primary productivity in the composite lake sample at the time of assay, in spite of losses of about 5 µg/l of dissolved phosphorus and 130 µg/l of nitrogen from the time the sample was collected to

the time the assay was begun. Had these losses not occurred, the control yield probably would have been about 15 mg/l.

The increased yield with the addition of nitrogen alone, and the lack of response to increasing levels of orthophosphorus show that the assay sample was nitrogen limited. A nitrogen/phosphorus ratio of 6/1 in the lake at the time the assay sample was collected also indicates nitrogen limitation. In addition, the lake appeared to be limited by nitrogen during the first two sampling periods as well (N/P ratios were about 2/1 on both occasions).

D. Trophic Condition:

Survey data and the records of others show that Lake Kegonsa is eutrophic. Survey limnologists observed heavy growths of rooted aquatic vegetation in much of the lake.

Of the 44 Wisconsin lakes sampled in the fall, when essentially all were well-mixed, 33 had less mean total phosphorus, 36 had less mean dissolved phosphorus, and 21 had less mean inorganic nitrogen. For all data, 34 lakes had less mean chlorophyll a, and 27 had a lower algal assay control yield.

V. NUTRIENT LOADINGS
(See Appendix C for data)

For the determination of nutrient loadings, the Wisconsin National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page vi), except for the high runoff months of April and May when two samples were collected. Sampling was begun in September, 1972, and was completed in August, 1973.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Wisconsin District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated by using the mean concentrations in Halverson Creek at station D-1 and the mean annual ZZ flow.

The Village of Cottage Grove declined participation in the Survey, and nutrient loads attributed to that source were estimated* and subtracted from the loads calculated for Door Creek at station B-1.

The wastes from the City of McFarland are treated in the Madison Metropolitan Sewer District facilities.

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* See Working Paper No. 1.

A. Waste Sources:

1. Known municipal -

Name	Pop. Served	Treatment	Mean Flow (mgd)	Receiving Water
Cottage Grove	480*	Stabiliza-tion Ponds	0.030**	Door Creek

2. Industrial - None known

* McKersie, et al., 1971.
** Estimated; see Working Paper No. 1.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	lbs N/ yr	% of total
a. Tributaries (non-point load) -		
Yahara River	37,180	82.8
Door Creek	2,530	5.6
b. Minor tributaries & immediate drainage (non-point load) -	3,330	7.4
c. Known municipal STP's -		
Cottage Grove	1,200	2.7
d. Septic tanks* -	270	0.6
e. Industrial - None known	-	-
f. Direct precipitation** -	420	0.9
Total	44,930	100.0

2. Outputs -

Lake outlet - Yahara River 43,460

3. Net annual P accumulation - 1,470 pounds

* Estimated 385 dwellings, 3 resorts, and 1 park on lakeshore; see Working Paper No. 1.
** Estimated; see Working Paper No. 1.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	lbs N/ yr	% of total
a. Tributaries (non-point load) -		
Yahara River	451,370	66.7
Door Creek	125,310	18.5
b. Minor tributaries & immediate drainage (non-point load) -	60,650	9.0
c. Known municipal STP's -		
Cottage Grove	3,600	0.5
d. Septic tanks* -	9,910	1.5
e. Industrial - None known	-	-
f. Direct precipitation** -	26,170	3.9
Total	677,010	100.0

2. Outputs -

Lake outlet - Yahara River 465,620

3. Net annual N accumulation - 211,390 pounds

* Estimated 385 dwellings, 3 resorts, and 1 park on lakeshore; see Working Paper No. 1.
** Estimated; see Working Paper No. 1.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	lbs P/mi^2/yr	lbs N/mi^2/yr
Yahara River at A-2	112	1,364
Yahara River at A-3* (outlet of L. Waubesa)	109	1,393
Door Creek	94	4,641

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (in press). Essentially, his "dangerous" rate is the rate at which the receiving waters would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

	Total Phosphorus		Total Nitrogen	
Units	Total	Accumulated	Total	Accumulated
lbs/acre/yr	16.5	0.5	249.3	77.8
grams/m^2/yr	1.85	0.06	27.9	8.7

Vollenweider loading rates for phosphorus (g/m^2/yr) based on mean depth and mean hydraulic retention time of Lake Kegonsa:

"Dangerous" (eutrophic rate)	0.72
"Permissible" (oligotrophic rate)	0.36

* Mean Survey concentrations x mean U.S.G.S. flow (41 years of record) and drainage area at outlet of Lake Waubesa.

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VII. APPENDICES

APPENDIX A

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR WISCONSIN 9/30/74

LAKE CODE 5520 LAKE KEGONSA

TOTAL DRAINAGE AREA OF LAKE 384.00

TRIBUTARY	SUB-DRAINAGE AREA	NORMALIZED FLOWS JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
5520A1	384.00	142.20	170.60	293.80	312.80	199.00	151.70	142.20	123.20	104.30	123.20	151.70	142.20	171.32
5520A2	331.00	120.00	150.00	270.00	280.00	180.00	140.00	130.00	110.00	92.00	110.00	130.00	120.00	152.60
5520R1	27.00	5.40	7.60	27.00	25.00	11.00	7.00	6.40	4.60	4.00	4.70	6.20	5.40	9.53
5520ZZ	26.00	5.30	7.30	26.00	24.00	11.00	6.80	6.10	4.40	3.80	4.30	5.90	5.30	9.19

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 384.00
SUM OF SUB-DRAINAGE AREAS = 384.00

TOTAL FLOW IN = 2056.50
TOTAL FLOW OUT = 2056.90

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5520A1	9	72	160.00	23	200.00				
	10	72	170.00	14	160.00				
	11	72	210.00						
	12	72	170.00	10	160.00				
	1	73	240.00						
	2	73	270.00	11	250.00				
	3	73	500.00	11	570.00				
	4	73	530.00	14	500.00	28	530.00		
	5	73	520.00	12	570.00	28	470.00		
	6	73	300.00	9	320.00				
	7	73	270.00	15	270.00				
	8	73	230.00	12	240.00				
5520A2	9	72	130.00	23	170.00				
	10	72	140.00	14	130.00				
	11	72	170.00						
	12	72	150.00	10	140.00				
	1	73	200.00						
	2	73	230.00	11	210.00				
	3	73	440.00	11	500.00				
	4	73	450.00	14	440.00	28	450.00		
	5	73	440.00	12	490.00	28	400.00		
	6	73	250.00	9	260.00				
	7	73	220.00	15	220.00				
	8	73	190.00	12	200.00				

TRIBUTARY FLOW INFORMATION FOR WISCONSIN 9/30/74

LAKE CODE 5520 LAKE KEGONSA

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
552081	9	72	5.80	23	7.60				
	10	72	6.70	14	6.00				
	11	72	7.80						
	12	72	6.60	10	6.20				
	1	73	8.70						
	2	73	11.00	11	10.00				
	3	73	44.00	11	50.00				
	4	73	40.00	14	38.00	28	40.00		
	5	73	29.00	12	32.00	28	25.00		
	6	73	13.00	9	14.00				
	7	73	11.00	15	11.00				
	8	73	8.20	12	8.70				
552022	9	72	5.60	23	7.20				
	10	72	6.40	14	5.80				
	11	72	7.40						
	12	72	6.20	10	6.00				
	1	73	8.20						
	2	73	11.00	11	10.00				
	3	73	42.00	11	48.00				
	4	73	38.00	14	37.00	28	38.00		
	5	73	28.00	12	30.00	28	24.00		
	6	73	12.00	9	13.00				
	7	73	11.00	15	11.00				
	8	73	7.80	12	8.40				

APPENDIX B

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 74/09/30

552001
42 58 30.0 089 15 30.0
KEGONSA LAKE
55 WISCONSIN

11EPALES 2111202
5 0004 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/22	15 20	0000	21.5	12.2	48	360	9.30	170	0.060	0.040	0.096	0.078
72/08/20	09 55	0000	26.4	4.7		370	9.00	135	0.130	0.200	0.138	0.093
72/11/10	11 50	0000		10.0	36	440	8.30	155	0.220	0.170	0.083	0.068

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/22	15 20	0000	11.5J
72/08/20	09 55	0000	25.1J
72/11/10	11 50	0000	49.4J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/09/30

552002
42 58 00.0 089 14 00.0
LAKE KEGONSA
55 WISCONSIN

11EPALES 2111202
5 0010 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/22	15 40	0000	20.3	9.4		390	8.90	180	0.060	0.110	0.119	0.079
	15 40	0009	20.3	9.5		380	8.90	183	0.060	0.110	0.130	0.082
72/08/20	10 05	0000			36	390	9.00	160	0.070	0.070	0.476	0.113
	10 05	0004	24.7	8.5		390	9.00	160	0.060	0.060	0.160	0.113
72/11/10	12 10	0000			56	430	8.80	181	0.250	0.190	0.109	0.069
	12 10	0004	6.7	11.2		430	8.80	178	0.210	0.160	0.106	0.068
	12 10	0012	6.7	11.2		420	8.80	180	0.220	0.170	0.104	0.070
	12 10	0018	6.7	11.3		420	8.80	176	0.210	0.160	0.112	0.068

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/22	15 40	0000	30.1J
72/08/20	10 05	0000	36.4J
72/11/10	12 10	0000	16.5J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/09/30

552003
42 57 30.0 089 16 30.0
KEGONSA LAKE
55 WISCONSIN

11EPALES
5

2111202
0004 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/22	16 00	0000	21.6	12.6	36	370	9.10	180	0.060	0.080	0.122	0.105
72/08/20	10 20	0000			42	390	9.10	162	0.080	0.090	0.142	0.119
	10 20	0004	25.8	10.2		390	9.10	160	0.090	0.090	0.143	0.108
72/11/10	11 55	0000			54	440	8.80	178	0.280	0.180	0.103	0.053
	11 55	0006	6.4	11.7		440	8.80	170	0.270	0.170	0.104	0.057

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/22	16 00	0000	27.6J
72/08/20	10 20	0000	19.1J
72/11/10	11 55	0000	62.2J

J VALUE KNOWN TO BE IN ERROR

APPENDIX C

TRIBUTARY DATA

STORET RETRIEVAL DATE 74/10/02

5520A1 LS5520A1
42 58 00.0 089 13 30.0
YAHARA RIVER
55 15 STOUGHTON
0/LAKE KEGONSA
CO RD BRDG 3 MI N OF STOUGHTON
11EPALFS 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	10 23		0.076	0.950	0.083	0.068	0.120
72/10/14	14 12		0.068	1.200	0.090	0.075	0.150
72/11/11	14 05		0.189	1.200	0.096	0.056	0.130
72/12/10	10 30		0.252	0.940	0.019	0.032	0.094
73/01/14	10 00		0.210	1.100	0.044	0.019	0.075
73/02/11	14 06		0.052	1.100	0.013	0.011	0.070
73/03/11	14 45		0.168	0.920	0.052	0.026	0.075
73/04/14	15 00		0.560	1.600	0.029	0.025	0.120
73/04/28	09 10		0.520	1.150	0.056	0.029	0.090
73/05/12	10 30		0.690	1.050	0.092	0.067	0.125
73/05/28	09 15		0.460	1.000	0.088	0.062	0.115
73/06/09	12 47		0.240		0.054	0.026	0.100
73/07/15	10 15		0.010K	1.200	0.021	0.154	0.230
73/08/12	13 50		0.016	0.660	0.550	0.189	0.220

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/10/02

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 5520A2          LS5520A2
42 59 00.0 089 16 00.0
YAHARA RIVER
55      15 EVANSVILLE
I/LAKE KEGONSA
CO HWY AB BRDG BELO MCFARLAND STP
11EPALES              2111204
4                     0000 FEET  DEPTH
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DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	09 40		0.080	1.050	0.089	0.032	0.080
72/10/14	15 00		0.065	1.050	0.064	0.046	0.086
72/11/11	14 25		0.176	0.890	0.115	0.071	0.105
72/12/10	11 00		0.240	0.860	0.038	0.036	0.064
73/01/14	10 40		0.280	0.815	0.036	0.033	0.110
73/02/11	14 41		0.176	1.150	0.035	0.024	0.070
73/03/11	14 00		0.310	1.100	0.220	0.069	0.120
73/04/14	15 30		0.480	2.300	0.052	0.050	0.130
73/04/28	09 25		0.420	1.470	0.044	0.078	0.100
73/05/12	10 50		0.510	0.960	0.029	0.078	0.120
73/05/28	10 15		0.410	1.150	0.200	0.098	0.135
73/06/09	13 10		0.240	2.000	0.091	0.147	0.200
73/07/15	10 35		0.078	0.840	0.037	0.120	0.175
73/08/12	14 10		0.570	0.730	0.023	0.120	0.150

STORET RETRIEVAL DATE 74/10/02

5520A3 LS5520A3
43 00 30.0 089 18 30.0
YAHARA RIVER
55 15 MADISON
I/LAKE KEGONSA
US 51 BRDG ABV MCFARLAND STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	09 00		0.046	0.950	0.071	0.025	0.079
72/10/14	13 38		0.042	1.350	0.067	0.046	0.130
72/11/11	13 35		0.140	0.980	0.140	0.069	0.118
72/12/10	10 00		0.210	1.150	0.020	0.034	0.084
73/01/14			0.320	0.920	0.080	0.054	0.085
73/02/11	13 32		0.300	1.100	0.067	0.050	0.105
73/03/11	13 40		0.280	1.050	0.100	0.052	0.110
73/04/14	14 30		0.570	1.130	0.023	0.054	0.140
73/04/24	09 35		0.490	1.500	0.048	0.061	0.120
73/05/12	10 10		0.650	1.800	0.132	0.084	0.125
73/05/28	10 00		0.450	0.940	0.088	0.092	0.125
73/06/09	12 25		0.231	2.675	0.048	0.075	0.165
73/07/15	09 55		0.010K	0.985	0.019	0.063	0.160
73/08/12	11 30		0.016	3.100	0.800	0.126	0.170

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/10/02

5520H1 LS5520H1
43 01 00.0 089 14 00.0
DOOR CREEK
55 15 SUN PRAIRIE
T/LAKE KEGONSA
CO HWY MN 3 MI E OF MCFARLAND
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	09 55		1.595	1.350	0.124	0.094	0.138
72/10/14	14 45		1.040	0.550	0.090	0.052	0.087
72/11/11	14 15		3.400	1.100	0.092	0.046	0.082
72/12/10	10 45		3.900	1.260	0.069	0.046	0.138
73/01/14	10 25		4.500	0.500	0.110	0.062	0.100
73/02/11	14 26		6.800	1.600	0.120	0.042	0.095
73/03/11	14 15		8.000	7.400	0.610	0.240	0.975
73/04/14	15 20		8.700	3.000	0.100	0.056	0.125
73/04/28	09 15		5.900	1.650	0.069	0.046	0.080
73/05/12	10 45		5.600	1.800	0.085	0.063	0.120
73/05/28	09 45		3.100	3.100	0.086	0.144	0.425
73/06/09	13 00		3.600	2.700	0.154	0.044	0.120
73/07/15	10 00		4.000	0.690	0.061	0.062	0.120
73/08/12	14 00		3.800	1.700	0.012	0.070	0.100

STORET RETRIEVAL DATE 74/10/02

5520C1 LS5520C1
42 58 00.0 089 13 00.0
UNNAMED CREEK
55 15 STOUGHTON
T/LAKE KEGONSA
CO RD BRDG .25 MI NW LAFOLLETTE CO PARK
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	10	12	0.311	1.250	0.220	0.075	0.168
72/10/14	15	30	1.500	1.600	0.096	0.070	0.220
72/11/11	14	10	1.400	1.200	0.100	0.071	0.160
72/12/10	10	35	3.000	2.900	0.130	0.063	0.270
73/01/14	10	10	3.300	0.230	0.126	0.030	0.045
73/02/11	14	15	2.500	1.260	0.280	0.050	0.087
73/03/11	14	30	1.260	2.600	0.360	0.230	0.480
73/04/14	15	12	1.040	2.500	0.130	0.080	0.210
73/04/28	09	10	1.660	3.200	0.160	0.126	0.200
73/05/12	10	40	1.500	1.470	0.115	0.180	0.390
73/05/28	09	30	0.580	3.000	0.074	0.140	0.490
73/06/09	12	50	2.000	3.360	0.162	0.089	0.300
73/07/15	10	20	2.800	1.400	0.100	0.067	0.130
73/08/12	14	55	2.700	0.340	0.018	0.084	0.140

STORET RETRIEVAL DATE 74/10/02

552001 LS552001
42 57 30.0 089 17 00.0
UNNAMED CREEK
55 15 EVANSVILLE
T/LAKE KEGONSA
US51 BRDG SW CORNER OF LAKE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	10 40		1.170	0.300	0.076	0.077	0.132
72/11/11	13 50		0.890	0.860	0.048	0.089	0.189
72/12/10	10 15		3.600	1.050	0.039	0.036	0.066
73/01/14	11 05		3.600	0.100K	0.050	0.020	0.055
73/02/11	13 40		3.500	0.230	0.082	0.048	0.075
73/03/11	15 10		1.640	3.100	0.570	0.310	0.775
73/04/14	15 45		2.100	2.100	0.130	0.100	0.210
73/04/28	09 00		3.500	1.050	0.037	0.040	0.067
73/05/12	10 20		3.700	0.480	0.040	0.063	0.105
73/05/28	09 00		2.080	0.940	0.069	0.088	0.200
73/07/15	10 10		3.100	0.480	0.050	0.063	0.115
73/08/12	13 40		0.490	0.480	0.198	0.170	0.220

K VALUE KNOWN TO BE LESS THAN INDICATED

30